PATENT ABSTRACTS OF JAPAN

(11)Publication number : 07-095566

(43)Date of publication of application : 07.04.1995

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(51)Int.Cl. H04N 7/24
G06T 9/00

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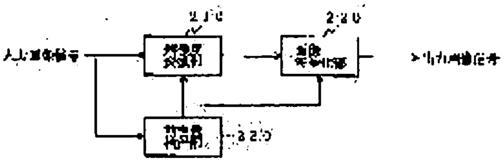
(54) METHOD AND DEVICE FOR ENCODING IMAGE

(57)Abstract:

PURPOSE: To compress an image signal with high quality by encoding the input image signal while automatically changing the resolution.

CONSTITUTION: A moving amount detection part 230 detects the moving amount of the input image signal and sends it to a resolution converting part 210 and an image encoding part 220. When the moving amount is large, the input image signal is converted into the image signal of low resolution by the resolution converting part 210 and when the moving amount is small, the input image signal is converted into the image signal of high resolution. The image encoding part 220 inputs and encodes the image signal which resolution is converted. Thus, the resolution of a still picture such as a photograph or a document is improved. Further, concerning the image of large motion, the resolution is lowered, and the motion can be preferentially encoded.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

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CLAIMS

[Claim(s)]
[Claim 1] The image coding approach which detects the amount of motions of the inputted picture signal, changes the resolution of the this detected picture signal which moved and was inputted according to the amount, and is characterized by encoding.
[Claim 2] Image coding equipment which inputs a picture signal and is characterized by to have the amount detecting element of motions which detects the amount of motions of an input picture signal, the resolution converter which was detected by said amount detecting element of motions, and which moves and changes the resolution of an input picture signal according to an amount, and the image coding section which encodes the picture signal in which resolution conversion was carried out by said resolution converter in the image coding equipment to encode.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the image coding approach and equipment which compress a picture signal with sufficient quality, and relates to the image coding approach and equipment which are used when accumulating in the case where a picture signal is transmitted and received between terminals, or a file, in detail.
[0002]
[Description of the Prior Art] The outline of the image communication device using ITU-TS advice H.261 which is the main examples of representation of the conventional image coding approach is shown in drawing 6 . The configuration of this pictorial communication equipment consists of a camera 11, the A/D-conversion section 21, the format conversion section 31, the image coding section 41, multiplex and the separation section 51, the image decryption section 61, the reverse format conversion section 71, a D/A converter 81, and a monitor 91. A signal 12 is a video signal outputted from the camera 11, and signal formats are analog signals, such as NTSC (National Television System Comittee), PAL (PhaseAltemate Line), and SECAM (Sequential Couleur a Memore). Moreover, a signal 82 is ****** MI to a monitor 91, and signal formats are analog signals, such as NTSC, PAL, and SECAM, like the output signal of a camera 11. A signal 22 is an input signal to the format conversion section 31, and is a digital video signal which changed analog signals, such as NTSC, PAL, and SECAM, in the A/D-conversion section 21. A signal 72 is an output signal from the reverse format conversion section 71, and a signal format is a digital video signal as well as a signal 22. A signal 32 is a common intermediate format (Common Intermediate Format:CIF or Quarteter CIF:QCIF). A signal 62 is an output signal from the image coding section 61, and a signal format is CIF or QCIF similarly. A signal 42 is a video signal compressed in the image coding section 41, and is an input signal to multiplex and the separation section 51. A signal 52 is an output signal of multiplex and the separation section 51, and is elongated by CIF or QCIF in the image decryption section 61.
[0003] A person, scenery, paintings and calligraphic works, etc. are picturized with a camera 11, and the video signal 12 is outputted in analog signal formats, such as NTSC, PAL, and SECAM, from a camera 11, turns into a digital signal 22 in the A/D-conversion section 21, and is inputted into the format conversion section 31. In order to use the image mark-ized section 41 according to ITU-TS international-standards-ized advice in that case, in the format conversion section 31, the inputted signal 22 is changed into the signal 32 of CIF or QCIF, and is compressed in the image coding section 41 according to the low bit rate coding method specified by ITU-TS advice H.261. This compressed digital video signal 42 is multiplexed by the frame structure further specified by the ITU-TS advice H.221 in multiplex and the separation section 51 with the digitized sound signal, a data signal, etc., and is sent to partner equipment through line switching networks, such as ISDN (Integrated Services Digital Network), and dedicated lines, such as a high-speed digital circuit.
[0004] On the other hand, if the multiplexed same signal is received from partner equipment, first, it will dissociate with a sound signal, a data signal, etc. in multiplex and the separation section 51, and the

compression digital video signal 52 will be decrypted in the image decryption section 61 specified by ITU-TS advice H.261. This decrypted signal 62 is changed into the analog signals 82, such as NTSC, PAL, and SECAM, as well as the output signal 12 of a camera 11 in the D/A converter 81 by becoming the digital signals 72, such as NTSC, PAL, and SECAM, in the reverse format conversion section 71 further, it is inputted into a monitor 91, and images, such as a person picturized by the other party, and scenery, paintings and calligraphic works, are reproduced on monitor display.

[0005] The decision of a format of CIF in above-mentioned pictorial communication equipment or QCIF will choose the format for which it has opted beforehand by the negotiation between equipment, and the user of the equipment concerned will use it.

[0006] The example of a configuration of the image coding equipment according to the coding method specified, the image coding section 41, i.e., ITU-TS advice H.261, of drawing 5 , is shown in drawing 6 .

[0007] while the picture signal inputted is sent to the motion compensation machine 1009 -- difference -- it is sent to a vessel 1001. a picture signal -- difference -- after the difference between the prediction signals searched for by motion compensation processing later mentioned in a vessel 1001 is taken, DCT conversion is carried out with the discrete cosine transform (DiscreateCosine Transform;DCT) vessel 1002. Furthermore, it quantizes with a quantizer 1003 and variable length coding of the picture signal by which DCT conversion was carried out is carried out with the variable-length encoder 1004.

[0008] On the other hand, the picture signal quantized with the quantizer 1003 is transformed inversely by the DCT multiplier with the reverse quantizer 1005, and it is further changed into the encoded differential signal in the reverse DCT converter 1006. this changed differential signal -- an adder 1007 -- setting -- difference -- addition between the prediction signals used for prediction with the vessel 1001 is taken, and generates the encoded picture signal. This picture signal is stored in a frame memory 1008.

[0009] The motion compensation machine 1009 inputs an input picture signal, reads the frame signal encoded one frame before this input picture signal from a frame memory 1008, performs motion compensation processing between those two frames, and generates a prediction signal. this prediction signal -- a frame memory 1008 -- minding -- difference -- it is sent to a vessel 1001 and an adder 1007. A motion compensation predicts the signal of the frame to be encoded from now on from the signal encoded one frame ago. case motion compensation processing has bad prediction effectiveness -- OFF -- becoming -- that case -- difference -- difference with the prediction signal in a vessel 1001 and an adder 1007 and addition serve as OFF.

[0010]

[Problem(s) to be Solved by the Invention] With the above-mentioned conventional technique, since it encoded using CIF or QCIF of a video-signal format determined between terminals, when the video signal of the photographic subject which needs the high resolution of a document, a photograph, etc. was encoded, there was a fault which becomes inadequate [resolution]. Although changing to image coding methods other than H.261, and encoding is also considered when encoding the video signal of a document, a photograph, etc., users, such as a terminal, will change by classification of a photographic subject, and there are problems, like a utilization kitchen is bad.

[0011] Moreover, with the above-mentioned conventional technique, although a motion of the picture signal encoded could not identify a fine dee taele visually in an intense part, it could encode even in the resolution of QCIF extent, but there was a fault which encodes the motion information which becomes important originally and which becomes difficult.

[0012] The object of this invention is to offer the image coding approach and equipment which can encode a picture signal with sufficient quality, as it raises resolution automatically when high resolution is required, and it changes to the coding method which makes resolution low automatically, when a motion is required, without a user being conscious of the difference in a photographic subject.

[0013]

[Means for Solving the Problem] This invention is detecting the amount of motions of the picture signal inputted, and having changed automatically the resolution of this detected picture signal that is moved and is encoded according to an amount.

[0014]
[Function] Resolution of the detected picture signal which is moved, and is encoded when an amount is small is made high, and when the amount of motions is large, resolution of the picture signal to encode is made low.
[0015] the case where a photograph, a document, etc. are transmitted -- high resolution -- ** -- although it becomes required, since it becomes a still picture, a motion is required and is lost. Then, the amounts of motions, such as a photographic subject, are detected, and when the amount of motions is small (i.e., when it becomes a still picture), resolution is raised noting that it is the case where it is needed in the high resolution of a document, a photograph, etc. On the other hand, since it is not a still picture when a motion is big, resolution is made low, and it changes so that priority may be given to a motion.
[0016] Thus, without a user being conscious of the difference in a photographic subject, resolution is changed automatically if needed and the image coding approach and equipment with high convenience and quality can be offered by encoding.
[0017]
[Example] The flow chart of one example of the coding approach of this invention is shown in drawing 1 . The picture signal of the person whom the camera etc. shot, scenery, paintings and calligraphic works, etc., etc. is inputted (100), and it once memorizes in memory etc. per frame (110). Then, the amount of motions of the frame unit of this inputted picture signal is measured (120), and the resolution of the input picture signal which was searched for and which should be moved and should be encoded according to an amount is determined (130). And the input picture signal memorized by memory etc. is read (140), and is changed into the determined resolution (150). The determined resolution information is used also in the case of coding, and encodes the input picture signal by which resolution conversion was carried out according to this resolution (160).
[0018] The block diagram of one example of the coding equipment of this invention is shown in drawing 2 . The picture signal inputted in order to encode moves while being sent to the resolution converter 210, and it is sent to the amount detecting element 230. In the amount detecting element 230 of motions, from the inputted picture signal, the amount of motions of the picture signal is detected, and it sends to the resolution converter 210 and the image coding section 220. the amount detection approach of motions -- inter-frame -- difference -- although an amount etc. is used, you may be except this that what is necessary is just a thing reflecting a motion of an input image. In the resolution converter 210, it changes into the frame signal with few [move, and / when an amount is large] pixels, i.e., a picture signal with low resolution, detected by the amount detecting element 230 of motions, and changes into the detected frame signal with an amount move and small [of the number of pixels] in many cases, i.e., a picture signal with high resolution. In the image coding section 220, a resolution conversion salmon ****** picture signal is encoded. Even if the image coding method used for this image coding section 220 is the case where resolution differs, it should just operate.
[0019] By the conventional image coding method shown in drawing 6 , the picture signal is efficiently encoded using inter-frame prediction of a motion compensation etc. However, when the resolution of a picture signal changed in the middle of coding and the number of pixels of the picture signal encoded from now on (resolution) differs from the number of pixels of the picture signal used for the prediction encoded previously, it becomes difficult to increase the efficiency.
[0020] The example of a configuration which applied this invention to drawing 3 at drawing 6 is shown. In this example, the trouble on the inter-frame prediction processing by the difference in the above-mentioned resolution is improvable. Among drawing 3 , since the block which has attached the same number as drawing 6 is the same actuation as drawing 6 , explanation is omitted. Moreover, the block of the resolution converter 210, the image coding section 220, and the amount detecting element 230 of motions is equivalent to the block of the same number in drawing 2 .
[0021] The inputted picture signal is sent to the resolution converter 210, and resolution conversion is carried out according to the amount of motions detected by the amount detecting element 230 of motions. Here, about detection of the amount of motions, the information on the motion compensation section 1009 is used. The amount of motion vectors of the block unit searched for at the time of a

motion compensation is specifically accumulated by the multiple frame in the motion vector accumulation section 1011, it moves and this accumulated is calculated as an amount. In this case , satisfactory , although it will ask for the resolution of the picture signal inputted into the resolution converter 210 in the amount of motions of the frame encoded in front of the multiple frame , since the information on the motion compensation section 1009 that an image coding method be needed constitutionally be use , there be an advantage in which the new increment in processing which be needed for motion detection live few on effectiveness . In order to add the approach of accumulation of a motion vector simply and to make a current motion reflect, the past value may make heavy burden attachment small, and may add it. Moreover, you may be approaches other than this.

[0022] It moves, and an amount is sent to the image coding section 220 whole, and modification of the number of processing picture signals by the difference in resolution called for by the amount detecting element 230 of motions is made. Moreover, in order to encode in the resolution converter 1010 for motion compensations one frame before the resolution of the picture signal inputted from the resolution converter 210, to double with the resolution of a current frame the picture signal accumulated in the frame memory 1008 in order to adjust the resolution of the picture signal used for prediction, to perform amplification/cutback and to perform a motion compensation, it sends to the motion compensation section 1009. The resolution of the picture signal and input image which are used for prediction is in agreement by this, and the above-mentioned problem can be solved.

[0023] In the example of a configuration of drawing 3 , it is necessary to have the resolution converter 1010 for motion compensations in the image coding section 220. However, this resolution conversion can be simplified by limiting the pattern of resolution to change.

[0024] An example of the resolution conversion approach is shown in drawing 4 . For example, CIF is the resolution of 352 pixel x288 line, and QCIF is the resolution of 176 pixel x144 line. Therefore, as shown in drawing 4 (a) between these two graphics formats, the conversion to QCIF from CIF is attained by 1 pixel and the infanticide in every line. Conversely, the conversion to CIF from QCIF becomes possible by transposing 1 pixel to 4 pixels, as shown in drawing 4 (b). When resolution is still more nearly required, conversion between image Huu Matt of one 4 times its resolution [CIF and] of this can also be used. These resolution conversion is realizable by simple infanticide and amplification. Moreover, in coding, since the resolution of the frame used for motion prediction and the resolution of an input frame are in agreement, it can predict easily.

[0025] In the above explanation, although QCIF and CIF were mainly shown in the example, of course, you may be except this, for example, may combine with conversion in images, such as 1/4 of QCIF and conversion in small images, such as the 1/4, 4 times of CIF, or 4 times.

[0026]

[Effect of the Invention] As mentioned above, if this invention is used, in the part which needs resolution, a picture signal can be encoded with sufficient quality in the part which encodes the picture signal of high resolution automatically, and seldom needs resolution, without resolution's becoming low automatically and a user being conscious of the difference in a photographic subject.

[0027] These resolution conversion is determined by the amount of motions of an input picture signal, and when a motion is small, resolution is high, and when a motion is large, resolution is specifically controlled low. The object image which needs resolution depends this on their being still pictures, such as a photograph and a document, in many cases, and when human being's vision property has a large motion, the resolution to resolution deteriorates, and when a motion is small, resolution's to resolution corresponds also with the property of becoming high.

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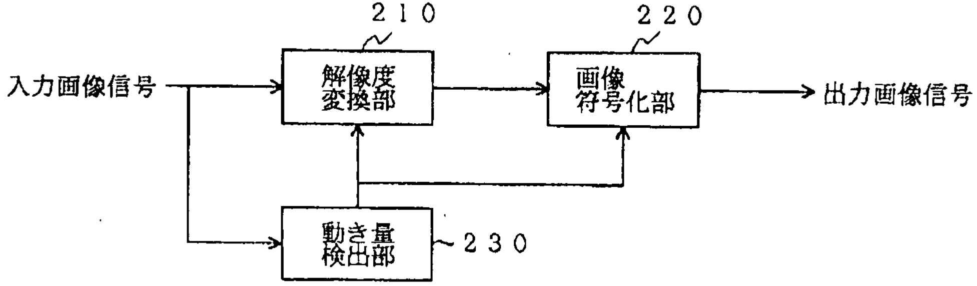
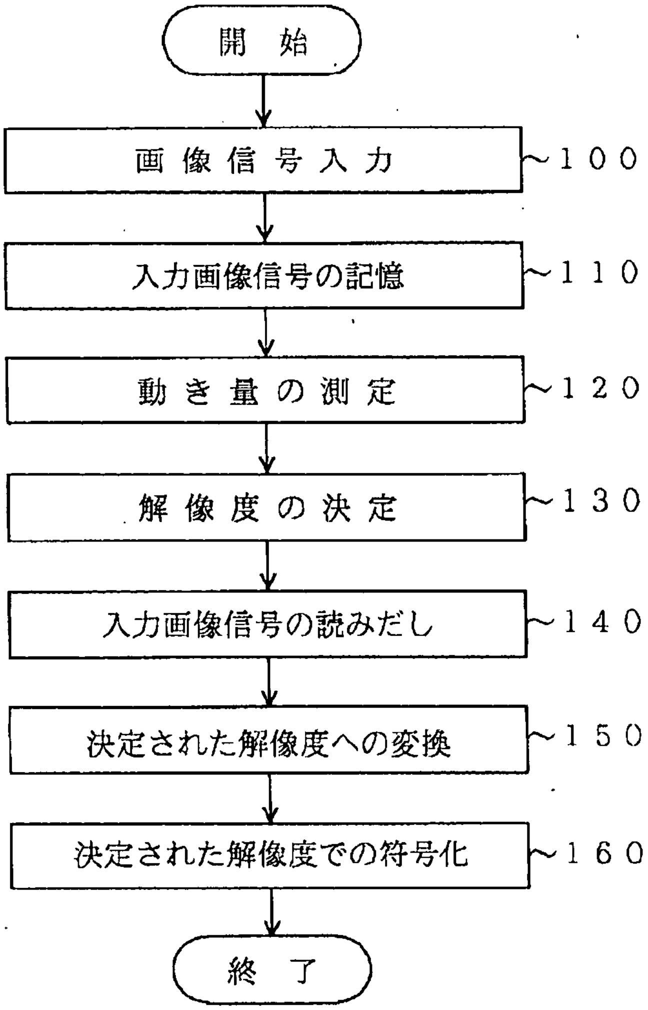
DRAWINGS

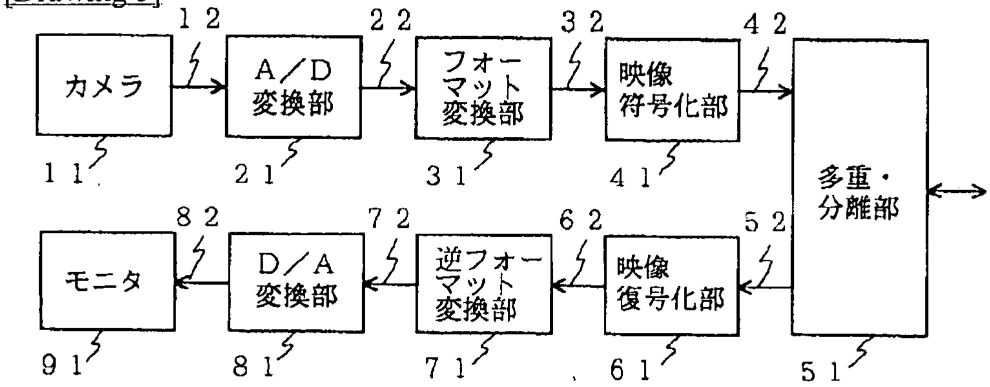
[Drawing 2]


210
220
入力画像信号
解像度変換部
画像符号化部
出力画像信号
動き量検出部
230

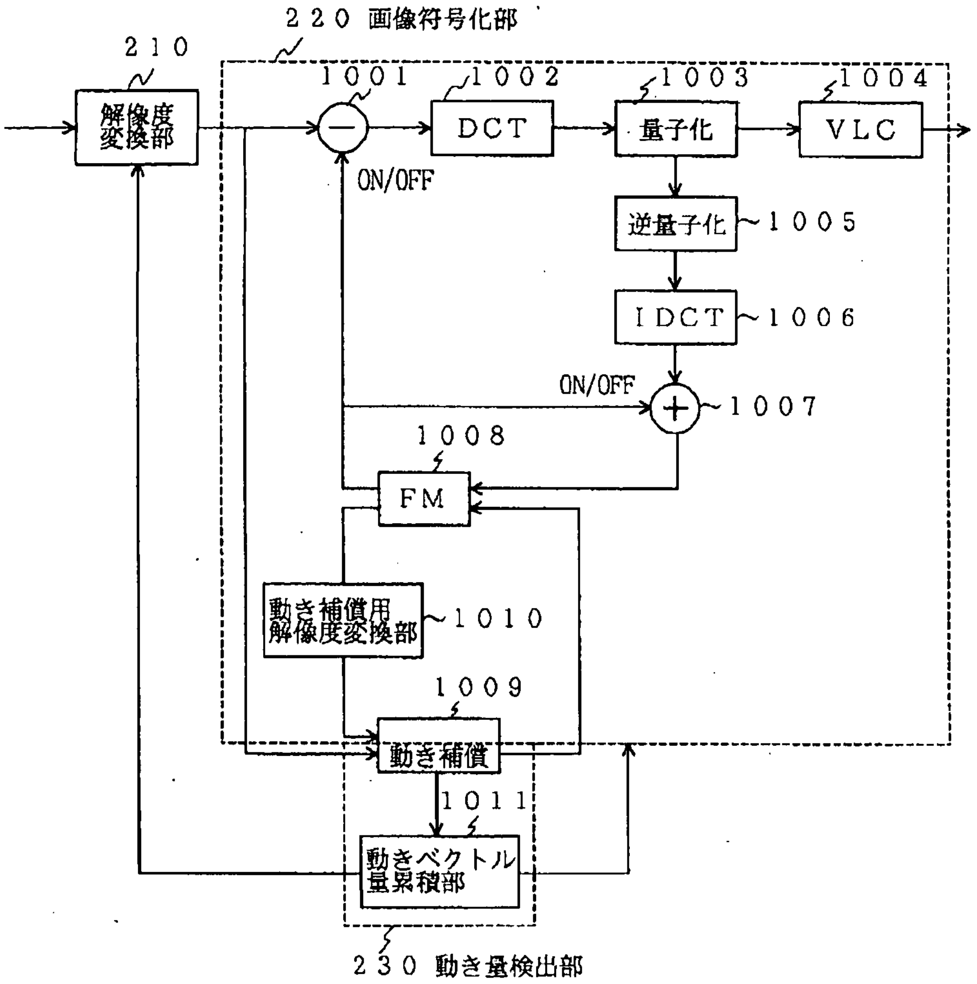
[Drawing 1]


開　始
画像信号入力
～100
入力画像信号の記憶
～110
動き量の測定
～120
解像度の決定
～130
入力画像信号の読みだし
～140
決定された解像度への変換
～150
決定された解像度での符号化
～160
終　了

[Drawing 5]

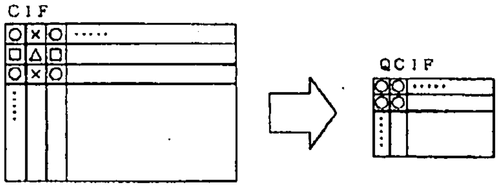

カメラ
11
12
A／D変換部
21
22
フォーマット変換部
31
32
映像符号化部
41
42
多重・分離部
51
52
映像復号化部
61
62
逆フォーマット変換部
71
72
D／A変換部
81
82
モニタ
91

[Drawing 3]

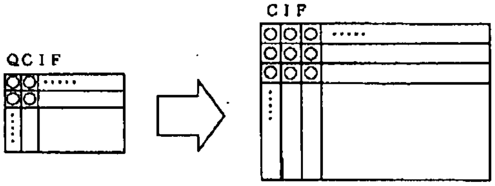

２２０ 画像符号化部
２１０
解像度変換部
１００１
１００２
DCT
１００３
量子化
１００４
VLC
ON/OFF
逆量子化
１００５
IDCT
１００６
ON/OFF
１００７
１００８
FM
動き補償用解像度変換部
１０１０
１００９
動き補償
１０１１
動きベクトル量累積部
２３０ 動き量検出部

[Drawing 4]

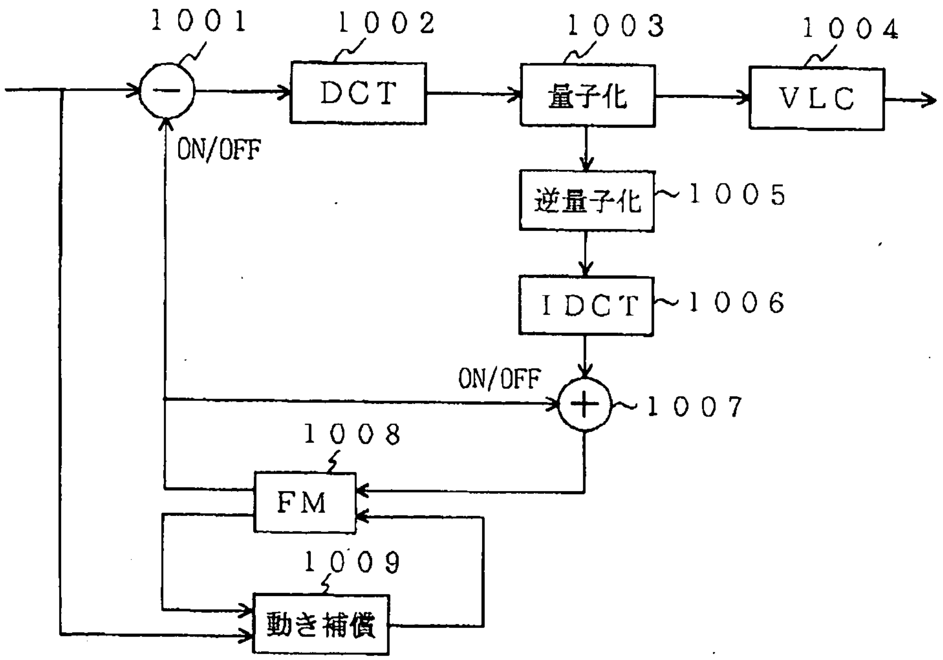
(a) ＣＩＦからＱＣＩＦへの変換



(b) ＱＣＩＦからＣＩＦへの変換



[Drawing 6]


1001
1002
1003
1004
DCT
量子化
VLC
ON/OFF
逆量子化
1005
IDCT
1006
ON/OFF
1007
1008
FM
1009
動き補償

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